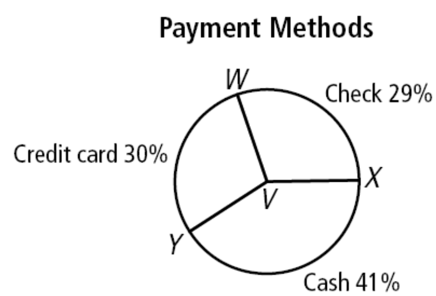
Pre-AP Geometry 12-2 Study Guide: Arcs and Chords (pp 802-809)

Attendance Problems

1. What percent of 60 is 18?

2. What number is 44% of 6?

3. Find $m\measuredangle WVX$.



- I can apply properties of arcs.
- I can apply properties of chords.

Vocabulary			
Arc	Adjacent Arcs	Semicircle	Minor arc
congruent arcs	Central angle	Major Arc	

<u>Common Core</u>

<u>CC.9-12.G.C.2</u> Identify and describe relationships among inscribed angles, radii, and chords.

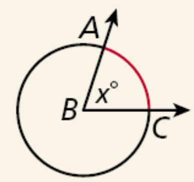
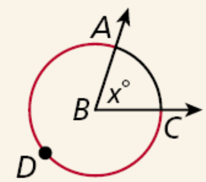
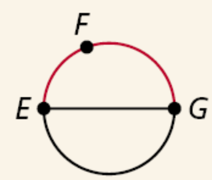
<u>CC.12.2: CC.9-12.G.CO.12</u> Make formal geometric constructions with a variety of tools and methods.

A **<u>central angle</u>** is an angle whose vertex is the center of a circle. An **<u>arc</u>** is an unbroken part of a circle consisting of two points called the endpoints and all the points on the circle between them.

Question: What is the hidden math term?
Answer: Circle graph.

"Transform adversity into an enjoyable challenge!"—*Author and Researcher, Mihalyi Czikszent*

Arcs and Their Measure

ARC	MEASURE	DIAGRAM
A **minor arc** is an arc whose points are on or in the interior of a central angle.	The measure of a minor arc is equal to the measure of its central angle. $m\overset{\frown}{AC} = m\angle ABC = x°$	
A **major arc** is an arc whose points are on or in the exterior of a central angle.	The measure of a major arc is equal to 360° minus the measure of its central angle. $m\overset{\frown}{ADC} = 360° - m\angle ABC$ $= 360° - x°$	
If the endpoints of an arc lie on a diameter, the arc is a **semicircle**.	The measure of a semicircle is equal to 180°. $m\overset{\frown}{EFG} = 180°$	

Writing Math

Minor arcs may be named by two points. Major arcs and semicircles must be named by three points.

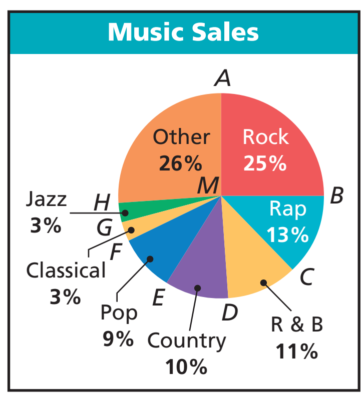
1 *Data Application*

The circle graph shows the types of music sold during one week at a music store. Find $m\overset{\frown}{BC}$.

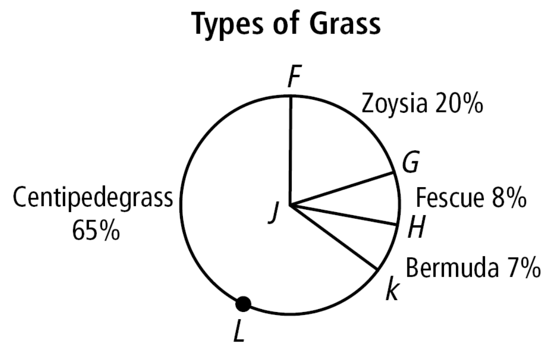
$m\overset{\frown}{BC} = m\angle BMC$ — *m of arc = m of central ∠.*

$m\angle BMC = 0.13(360°)$ — *Central ∠ is 13% of the ⊙.*

$= 46.8°$



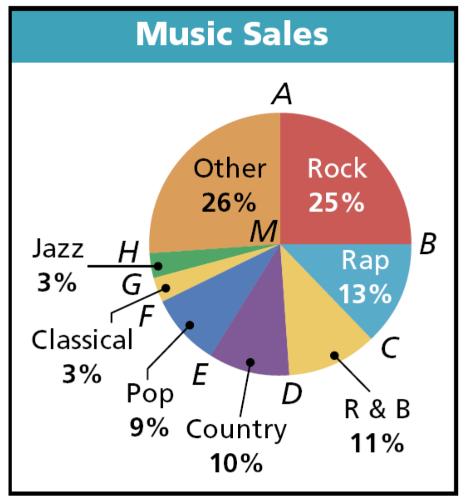
Example 1. The circle graph shows the types of grass planted in the yards of one neighborhood. Find $m\widehat{KLF}$.



<u>Guided Practice</u>. Use the graph to find each of the following.

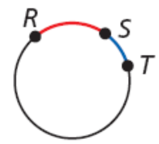
4. $m\measuredangle FMC$

5. $m\widehat{AHB}$



6. $m\measuredangle EMD$

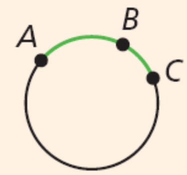
<u>Adjacent arcs</u> are arcs of the same circle that intersect at exactly one point. $\overset{\frown}{RS}$ and $\overset{\frown}{ST}$ are adjacent arcs.



Postulate 11-2-1 **Arc Addition Postulate**

The measure of an arc formed by two adjacent arcs is the sum of the measures of the two arcs.

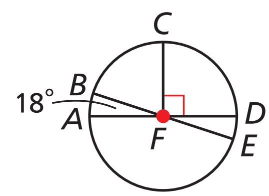
$$m\overset{\frown}{ABC} = m\overset{\frown}{AB} + m\overset{\frown}{BC}$$



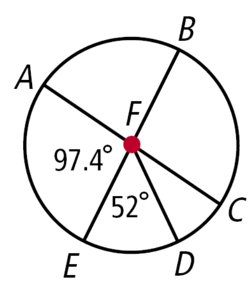
2 Using the Arc Addition Postulate

Find $m\overset{\frown}{CDE}$

$m\overset{\frown}{CD} = 90°$	*$m\angle CFD = 90°$*
$m\angle DFE = 18°$	*Vert. ∡s Thm.*
$m\overset{\frown}{DE} = 18°$	*$m\angle DFE = 18°$*
$m\overset{\frown}{CE} = m\overset{\frown}{CD} + m\overset{\frown}{DE}$	*Arc Add. Post.*
$= 90° + 18° = 108°$	*Substitute and simplify.*

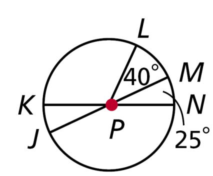


<u>Example 2</u>. Find $m\overset{\frown}{BD}$.

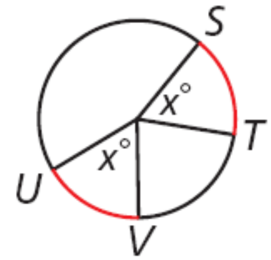


<u>Guided Practice</u>. Find each measure.

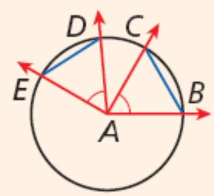
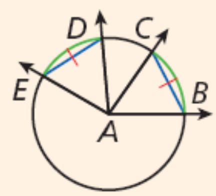
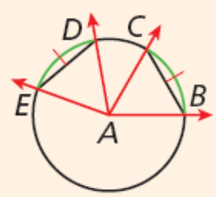
7. $m\overset{\frown}{JKL}$ **8.** $m\overset{\frown}{LJN}$



Within a circle or congruent circles, **<u>congruent arcs</u>** are two arcs that have the same measure. In the figure $\widehat{ST} \cong \widehat{UV}$.



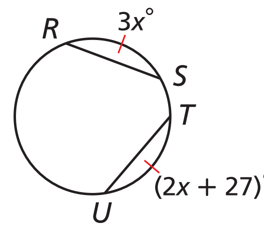
Theorem 11-2-2

THEOREM	HYPOTHESIS		CONCLUSION
In a circle or congruent circles:			
(1) Congruent central angles have congruent chords.		$\angle EAD \cong \angle BAC$	$\overline{DE} \cong \overline{BC}$
(2) Congruent chords have congruent arcs.		$\overline{ED} \cong \overline{BC}$	$\widehat{DE} \cong \widehat{BC}$
(3) Congruent arcs have congruent central angles.		$\widehat{ED} \cong \widehat{BC}$	$\angle DAE \cong \angle BAC$

3 Applying Congruent Angles, Arcs, and Chords

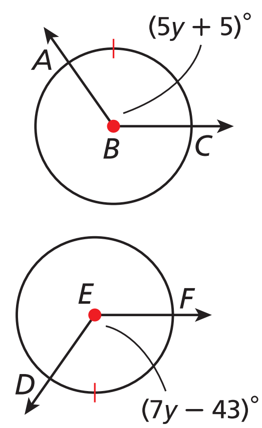
Find each measure.

A $\overline{RS} \cong \overline{TU}$. Find $m\widehat{RS}$.



$\widehat{RS} \cong \widehat{TU}$	*≅ chords have ≅ arcs.*
$m\widehat{RS} = m\widehat{TU}$	*Def. of ≅ arcs*
$3x = 2x + 27$	*Substitute the given measures.*
$x = 27$	*Subtract 2x from both sides.*
$m\widehat{RS} = 3(27)$	*Substitute 27 for x.*
$= 81°$	*Simplify.*

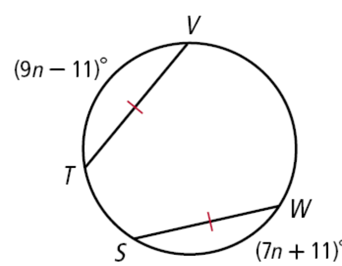
B $\odot B \cong \odot E$, and $\widehat{AC} \cong \widehat{DF}$. Find $m\angle DEF$.



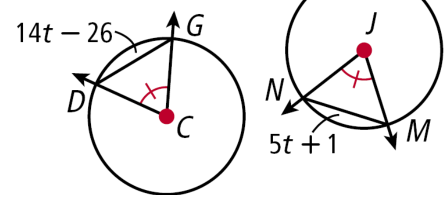
$\angle ABC \cong \angle DEF$	*≅ arcs have ≅ central ∠s.*
$m\angle ABC = m\angle DEF$	*Def. of ≅ ∠s*
$5y + 5 = 7y - 43$	*Substitute the given measures.*
$5 = 2y - 43$	*Subtract 5y from both sides.*
$48 = 2y$	*Add 43 to both sides.*
$24 = y$	*Divide both sides by 2.*
$m\angle DEF = 7(24) - 43$	*Substitute 24 for y.*
$= 125°$	*Simplify.*

Example 3. Find each measure.

A. $\overline{TV} \cong \overline{WS}$. Find $m\widehat{WS}$.

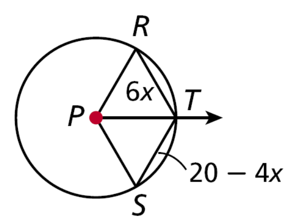


B. $\bigcirc C \cong \bigcirc J$, and $m\measuredangle GCD \cong m\measuredangle NJM$. Find NM.



<u>Guided Practice</u>. Find each measure.

9. $\overrightarrow{PT}$ bisects $\measuredangle RPS$. Find RT.



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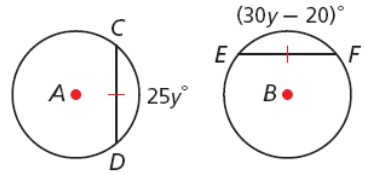
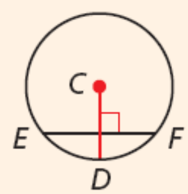
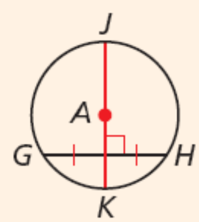
10. $\bigcirc A \cong \bigcirc B$ & $\overline{CD} \cong \overline{EF}$. Find $m\overset{\frown}{CD}$.

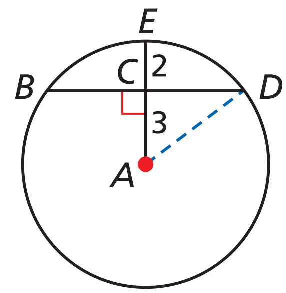


12-2 Arcs and chords: (p 807) 21, 23, 25, 27, 29, 30.

Theorems

THEOREM	HYPOTHESIS	CONCLUSION
11-2-3 In a circle, if a radius (or diameter) is perpendicular to a chord, then it bisects the chord and its arc.	 $\overline{CD} \perp \overline{EF}$	$\overline{CD}$ bisects $\overline{EF}$ and $\overset{\frown}{EF}$.
11-2-4 In a circle, the perpendicular bisector of a chord is a radius (or diameter).	 $\overline{JK}$ is $\perp$ bisector of $\overline{GH}$.	$\overline{JK}$ is a diameter of $\odot A$.

4 Using Radii and Chords



Find BD**.**

Step 1 Draw radius $\overline{AD}$.

$AD = 5$ — *Radii of a ⊙ are ≅.*

Step 2 Use the Pythagorean Theorem.

$CD^2 + AC^2 = AD^2$

$CD^2 + 3^2 = 5^2$ — *Substitute 3 for AC and 5 for AD.*

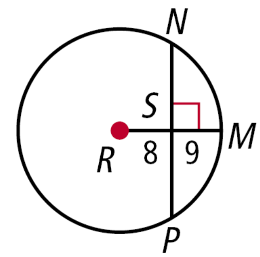
$CD^2 = 16$ — *Subtract 3^2 from both sides.*

$CD = 4$ — *Take the square root of both sides.*

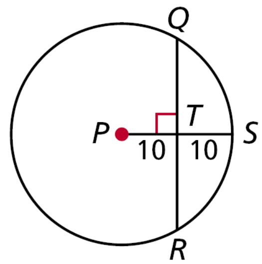
Step 3 Find BD.

$BD = 2(4) = 8$ — *$\overline{AE} \perp \overline{BD}$, so $\overline{AE}$ bisects $\overline{BD}$.*

Example 4. Find NP.



11. <u>Guided Practice</u>. Find QR. Round your final answer to the nearest tenth.



12-2 Arcs and chords: (p 807) 21, 23, 25, 27, 29-35, 37, 38, 40, 45-47.